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l. XLII

FLIGHT

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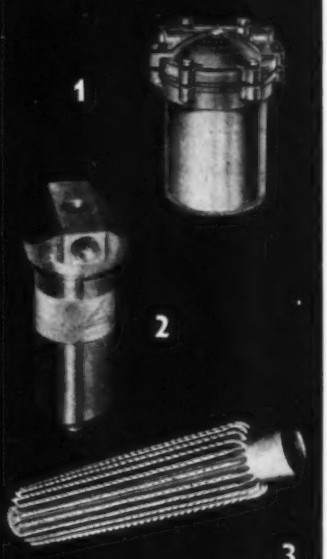

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FLIGHT and The AIRCRAFT ENGINEER

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The Outlook

Dive-bomber Discredited

IF one accepted all that the critics of our war organisation have been saying, one might conclude that the British defeat in Libya was due to our having no dive-bombers. This theory was decisively quashed in last week's debates in both Houses of Parliament. In the Lords, Viscount Trenchard said that he could not help feeling that the supporters of the dive-bomber were tending to raise false expectations among the public about the results to be obtained from these machines—though we certainly needed them and hoped to have them soon. In effect, their utility was very circumscribed. In the Commons, Mr. Lyttelton stated that in the opinion of our commanders a force of dive-bombers could not have affected the course of the battle in Libya, and that the enemy dive-bombers had proved largely ineffective. He confirmed what *Flight* said last week, that dive-bombers did not cause the fall of Bir Hakeim, which was due to artillery fire.

An interesting theory which Mr. Lyttelton put forward was that air superiority was of far less value in the desert than in enclosed country. It is obviously true that when troops and transport are not bound to roads they do not offer such good targets for air attack. It has also been pointed out elsewhere that, provided a commander has plenty of transport at his disposal, long lines of communication are not altogether a disadvantage in the desert. Our airfields are now far removed from the German bases, and our short-range fighters are consequently handicapped.

We are not able to agree with Mr. Lyttelton that the only justified criticism of our equipment in Libya was the lack of dive-bombers. There was also a lack of tank-busters, no allusions to which were made in either House. Possibly there are other classes of aircraft which an army ought to have, and we should like to be assured that our authorities have studied the experience of the "Attack" section of the U.S. Army Air Corps.

For the most part, the debate in both Houses turned on tanks, and it was at least interesting to learn from Lord Beaverbrook that the sending of tanks to Russia had not interfered with the supply of tanks for Libya, and that the Russians were very pleased with our Valentine tank. The Prime Minister added some definite figures. However, our troops in Libya have little enough cause to be pleased with the tank situation there, while our air superiority (which has never amounted to complete supremacy) has also proved a disappointment to those who expected that it would inevitably bring us victory.

Carriers in Narrow Seas

THE story of how the U.S. carrier *Wasp* carried British fighters to Malta gave great pleasure, we feel sure, to everyone in the Empire as well as in the United States. The Prime Minister mentioned in his speech in the House of Commons that carriers of the Royal Navy had been doing the same thing, and the help was needed, for Malta was at one time reduced to a dozen fighters.

The incident, however, poses a question. Not long ago Admiral Sir Andrew Cunningham said that the Mediterranean was a sea to be covered by shore-based aircraft, and only the other day Air Chief Marshal Sir Arthur Longmore, in a letter to *The Times*, wrote that the day of the carrier in the Mediterranean was over.

But, without carriers, how are we going to get short-range fighters to Malta? No doubt both those distinguished officers were looking ahead and not thinking merely of to-day and to-morrow.

It is certain that Malta must always have short-range fighters as part of her defence force. We all may hope and trust that when we have defeated the Axis the United Nations will take such steps that another war will not be probable for a very long time. But we have learnt from what happened between 1918 and 1939 that there is no getting away from the old Roman maxim, *Si vis pacem, para bellum:* If you want peace, prepare for war. It follows that even though the teeth of our present enemies may be drawn, Malta must always have a garrison, and it must always be possible to get short-range fighters into Malta if she should need them. When Mussolini has been removed it seems unlikely that Italy will ever again be the henchman of Germany. We all look forward to the day when France will again be the true friend of Britain. Nevertheless, the security of Malta must not depend on the goodwill of any foreign Power.

The answer seems to be that a carrier may have to be used as a transport for fighters, but will no longer figure as a fighting unit of the Mediterranean Fleet.

Allocating Production

FROM one point of view, the announcement by the Minister of Production, Mr. Lyttelton, in the House on June 24th, that it was hoped that the Americans would put their greatest emphasis on bombers, is to be welcomed. Aircraft of the bomber type do, on the whole, lend themselves better to large-scale production than do fighters, for example, and as *Flight* pointed out in the earlier stages of the war, there is a great deal to be said for America building such types of aircraft as can be flown across the Atlantic. Deliveries are speeded up and shipping space is saved.

The fighter, on the other hand, is a much more "individualistic" type of aircraft, and it is far more dangerous to freeze design than it is in the case of bombers. But if "America for bombers, Great Britain for fighters," is to be our motto in the future, it is surely rather a pity that so much effort has been concentrated in this country on the production of large four-engined bombers.

Mr. Lyttelton did not specify the *class* of bomber on which it was hoped America would concentrate, and it may be that he had in mind chiefly the smaller class.

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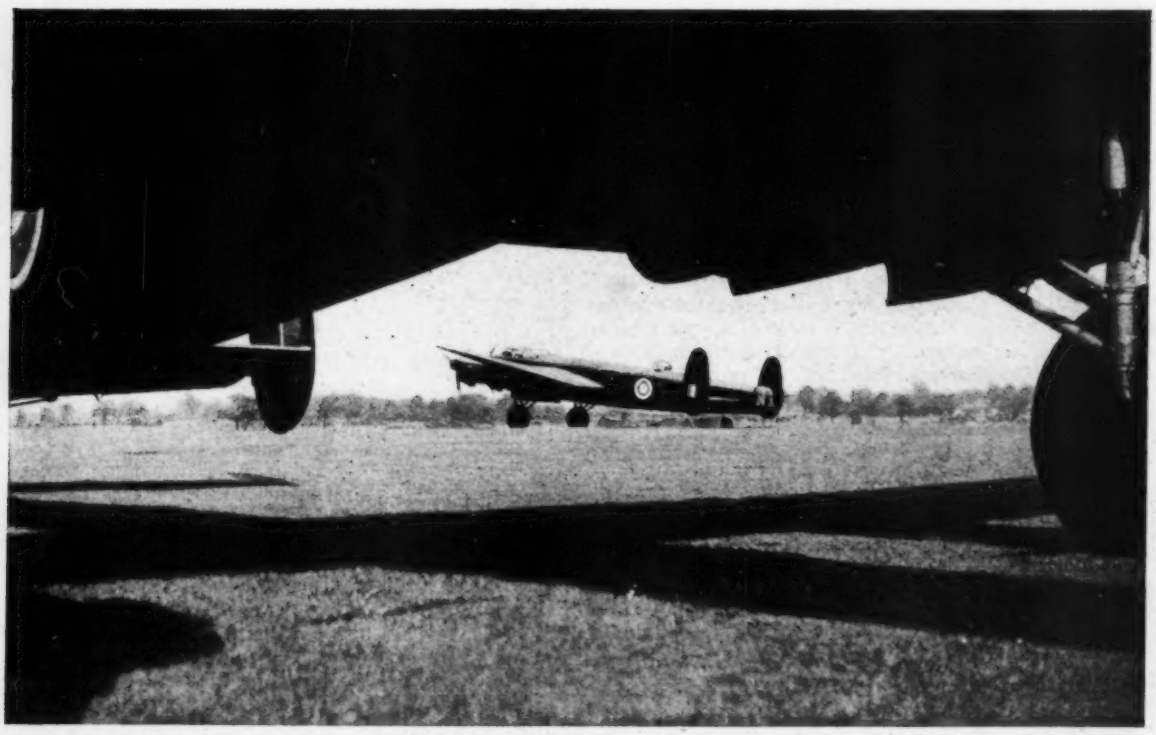


AUGSBURG RAIDER: An impressive picture of one of our new Avro Lancasters. Powered by four Rolls-Royce Merlins, the Lancaster is one of the fastest and most formidable of the heavy bomber types. Other pictures appear on pages 31, 32 and 33.

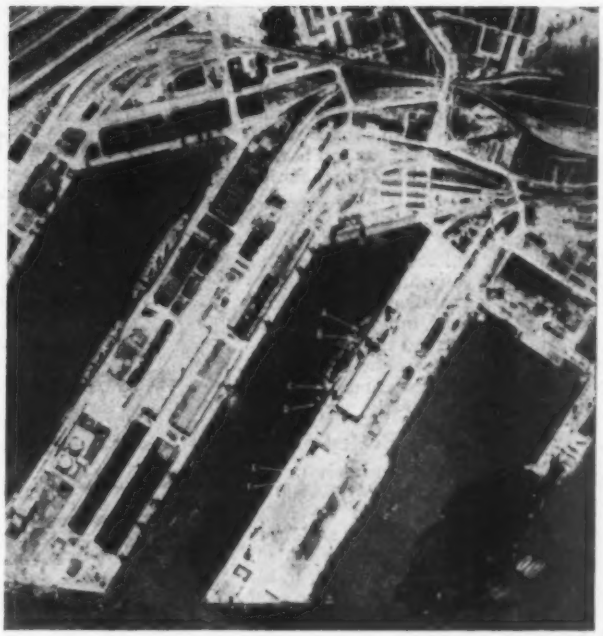
War in the Air

The Sting of the "Wasp" : The Germans in Sevastopol : More Raids on Bremen : The Great Battle in Egypt

ADMIRAL H. R. STARK, commanding the United States naval forces in Europe, is to be congratulated on the first public announcement which he has been able to make. The U.S. carrier *Wasp*, which can accommodate over 70 aircraft, and so is somewhat more commodious than our lamented *Ark Royal*, has been ferrying aircraft to Malta. Sometimes these were British aircraft, but the statement does not say if that was always the case. On one occasion British fighters took off from the flight deck and went straight into an air battle over the island, giving a nasty surprise to the Axis raiders. Then they landed on an airfield, refuelled (probably to the surprise of the other *habitués* of the field), took off again, and went on fighting.

The incident is not only gratifying because of the help which these reinforcements brought to Malta at the time of her hardest trials, or because the trips made by the *Wasp* and her escorts were without incident, but even more for the reason that it is such an outward and visible sign of the pooling of resources between the United States and Great Britain. We feel not the slightest doubt that the personal contacts made by the British and American officers and men on the trips were of the most cordial ; and we can well imagine the exultation with which the ship's company of the *Wasp* would learn of (it is unlikely that they could see) the fighters which they had brought going straight into battle and winning a victory. No doubt they thought of them and probably spoke of them as "*our* fighters."

There is no knowing to what depths the Hun will descend when he is annoyed (which means whenever he is opposed), but really the bombing of



GNEISENAU AT GDYNIA : The German battle cruiser is now lying in the Polish Baltic port. The annotation indicates the work in hand. (A) "A" turret missing ; (B) "B" turret without guns and armour plating ; (C) "Y" turret, also minus guns and armour ; (D) Camouflage round stern ; (E) Base of "A" turret ; (F) The main bearings of "A" turret. This is indicative of very extensive repair work in hand, or it may mean that the Germans are converting the ship into an aircraft carrier.

THE MUSIC OF A DISTANT DRUM ? One of two Me 109 Fs which were landed intact on a Russian airfield when their pilots gave themselves up. Will this sort of thing occur rather more frequently at some future date when the Russian winter approaches once more ?

WAR IN THE AIR

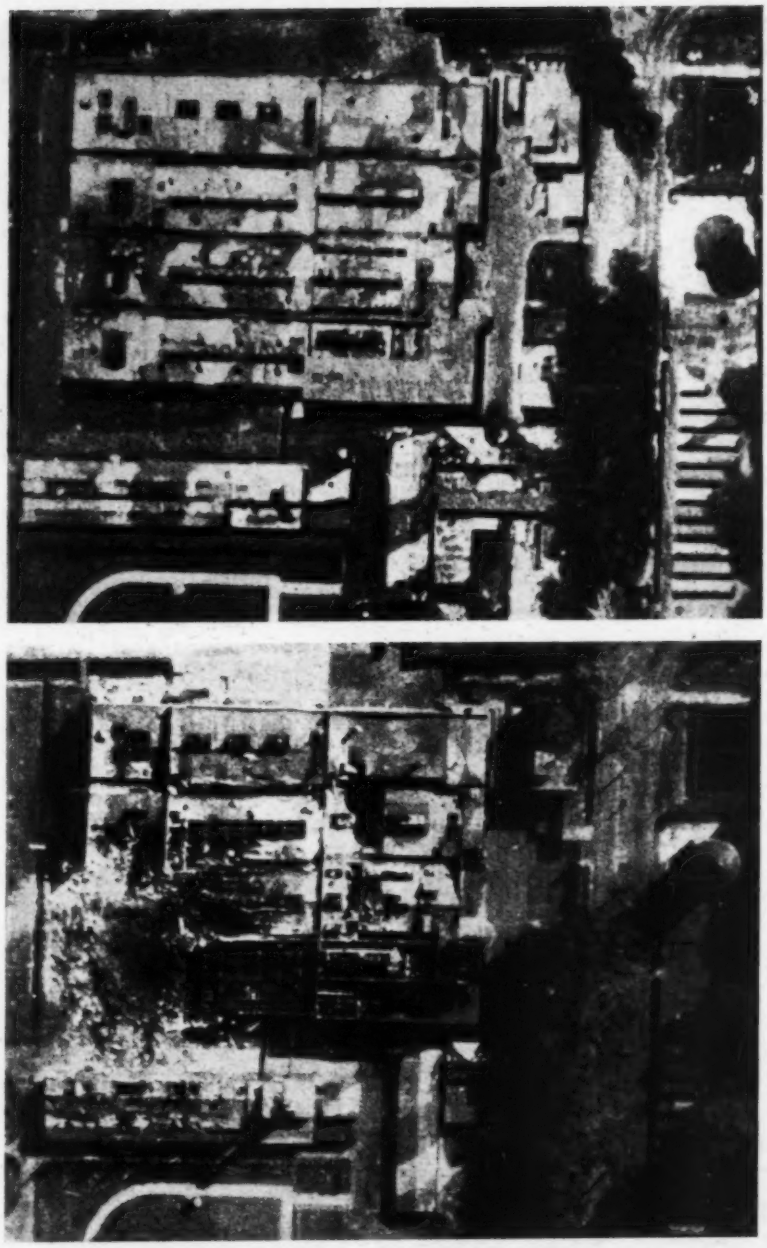
Weston-super-Mare on June 28th is more than usually hard to explain. The place is just a small seaside resort on the Bristol Channel. It can hardly be mentioned in Bædeker (it is known, to those who love it not, as Weston-super-Mud) and it is of no military importance at all. Damage was done in residential and shopping areas, and there were a number of casualties. Probably it was thought to be a safe and easy target, but two of the bombers which raided the West Country that night were shot down, one near the scene of its crimes and the other when it had nearly got home.

Bremen is Better

BREMEN is certainly a more profitable target than Weston-super-Mare, and the great raid by 1,000 bombers was followed up. Three times in a week was the place raided, and not lightly. Mr. Churchill, in his great House of Commons speech on the vote of censure, stuck up for our bomber effort against Germany, which he "knew there was a tendency to deride and disparage." But he also wished that the R.A.F. had 1,000 transport aircraft, which would have meant a cut in our "far from adequate bomber force." He ended that part of his speech by saying that if he were offered a gift of 1,000 heavy bombers or 1,000 transporters he was not at all sure which he should choose. It is comforting to think that our bomber strength is now being swollen by the arrival of American machines and crews.

In the four weeks between the first raid by 1,000 bombers on Cologne and the raid on Bremen on June 25th there were only four nights when the weather made it impossible for Bomber Command to operate. When enemy targets were obscured by thick weather our bombers have gone out in great numbers to lay mines. When the weather was favourable attention was concentrated on factories where U-boats or their engines are made. In addition, there have been ten raids by day on ports and one on an airfield in occupied territory during the above-mentioned period. In comparison with this record the doings of the *Luftwaffe* on what is now called the Western Front seem petty, though at Weston and other places a few people have been killed or injured on a number of nights and some minor damage has been done.

American Army bombers have raided Wake Island, which is 2,000 miles from Hawaii. One of the pilots who took part, Col. Meehan, said that finding the place was like "picking up a handkerchief in the ocean." The Japanese were taken by surprise, and in the bright moonlight the Americans bombed all their targets. Not one of their machines failed to get home.



BREMEN TARGET: The Focke-Wulf factory before and after the "over 1,000" raid on Bremen. A very heavy bomb made a direct hit on the machine shop, totally destroying a large part of the building in addition to extensive damage by blast. The factory is engaged mainly in the production of F.W.190 fighters.

United States pilots are now ferrying heavy and medium bombers direct from America to Australia, and some of them have been in action against the Japanese within a week after their departure from America.

Last week there was another small raid on Haifa early one morning. It is several months since that port was troubled, and it is likely that the Germans were reconnoitring to see if any movements by the Ninth Army were visible, as it might be expected to send reinforcements to the Eighth Army in the latter's fight to defend Egypt. Haifa, Beirut and Port Said were mentioned by Admiral Sir Andrew Cunningham as places where the Mediterranean Fleet could be based if Alexandria were to be lost.

The Germans have fought their way into Sevastopol after a terrific siege which has been going on for weeks. Their learned men may see in this a poetic revenge for the damage recently done to Augsburg, for the two names have the same meaning—City of Augustus. It seems strange, but up

WAR IN THE AIR

ENEMY AIR LOSSES TO JULY 4th

	Over G.B.	Over Continent	Middle East
June 28	1	1	3
,, 29	0	3	2
,, 30	0	0	0
July 1	1	3	8
,, 2	0	1	8
,, 3	2	0	28
,, 4	0	0	17
	4	8	66

Totals: West, 6,037; Middle East, over 4,126.

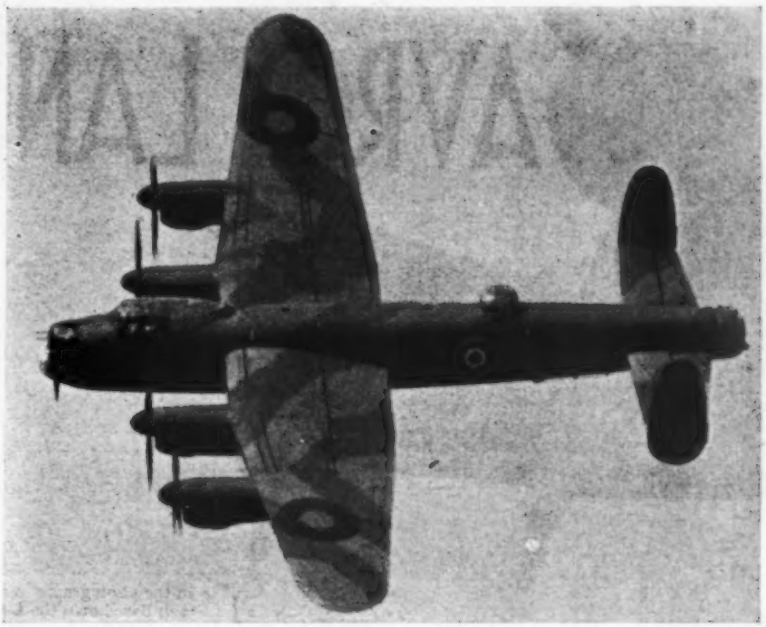
till near the end the airfield at Sevastopol was reported to be still active, and the Russian airmen were struggling hard against the hordes of bombers which the Germans used against the city. But it was certainly artillery rather than bombs which gradually pulverised the strong defences of the fortress. The Russian defenders have displayed the utmost heroism, and everywhere have fought on to the last man and the last cartridge. In such a struggle the losses of the assailants must always be greater than those of the defenders, and the Germans have paid a very heavy price.

The Battle of El Alamein

AT the moment of writing it would be idle to attempt to foretell the final result of the battle raging in Egypt, on which the whole future of the Middle East depends. Day after day Rommel hurled his wearied forces against those of General Auchinleck without clearing the way to Alexandria. The British General has been unable to risk heavy losses to his armour, and no information is available about the arrival of reinforcements. Accordingly, he has taken full advantage of his short supply lines to keep his columns constantly on the move, dashing in to do as much damage as possible, and then clearing off before the enemy could make his greater weight of metal tell.

Though without doubt this battle depends on armour, yet the part played by the Empire Air Forces has been one of the most important factors in it. Never have our air squadrons been so busy, and never have they held a more assured ascendancy in the air. The incident when a new squadron of South African Hurricanes found 15 Stukas about to dive on our front-line troops and destroyed 14 of them without loss to itself has been typical of what has been going on all over the battle front. It appears that in those fierce days the British air squadrons did not merely confine themselves to hitting at the enemy's supplies (though that work was continued), but also intervened in the actual land battle, using bomb and cannon. Attacks were kept up throughout each night, so that Rommel's wearied men were robbed of their sleep. The contraction of the area of operations made the work of the bombers easier.

Much of the air operations took place within sight of the ground troops on both sides, and had its usual effect. The British troops were greatly cheered by the sight, though they sometimes had to take cover to avoid a blazing Stuka which threatened to fall on their heads, while the enemy was correspondingly discouraged.



FOUR-ENGINED AVRO: This flying view of the Avro Lancaster emphasises the well-proportioned lines of this latest acquisition of R.A.F. Bomber Command. More photographs of the Lancaster are on pages 28, 32 and 33.

GRUMMAN AVENGER: The first photograph to be issued of the Grumman Avenger bomber-torpedo plane which was announced by the U.S. Navy Department to have been in action in the battle of Midway Island. It has typical Grumman lines and might easily be confused with the Martlet at a distance. Top speed is said to exceed 270 m.p.h. Bomb or torpedo load amounts to approximately 1 ton for a range of 1,400 miles.

BRITISH AIR LOSSES TO JULY 4th

	Over G.B. A'crft.	Over Continent B'brs.	Over Continent F'trs.	Middle East A'crft.
June 28	0	1	0	8
,, 29	0	9	5	2
,, 30	0	0	0	0
July 1	0	1	0	5
,, 2	0	15	0	7
,, 3	0	0	0	12
,, 4	0	3	0	10
	0	29	5	44 (5 pilots safe)

Totals: West, 4,102; Middle East, about 1,372.

AVRO LANCASTER

In the photographs appearing on these two pages the cameraman has shown the Lancaster from almost every viewpoint. The two three-quarter rear illustrations at the bottom of the opposite page show the wing flaps. From these pictures it is also very apparent what excellent fields of fire are enjoyed by the standard arrangement of power-operated gun turrets in the nose, tail and amidships. The new R.A.F. markings are also shown.

Photographs of the Latest Addition to Our Heavy Bomber Types

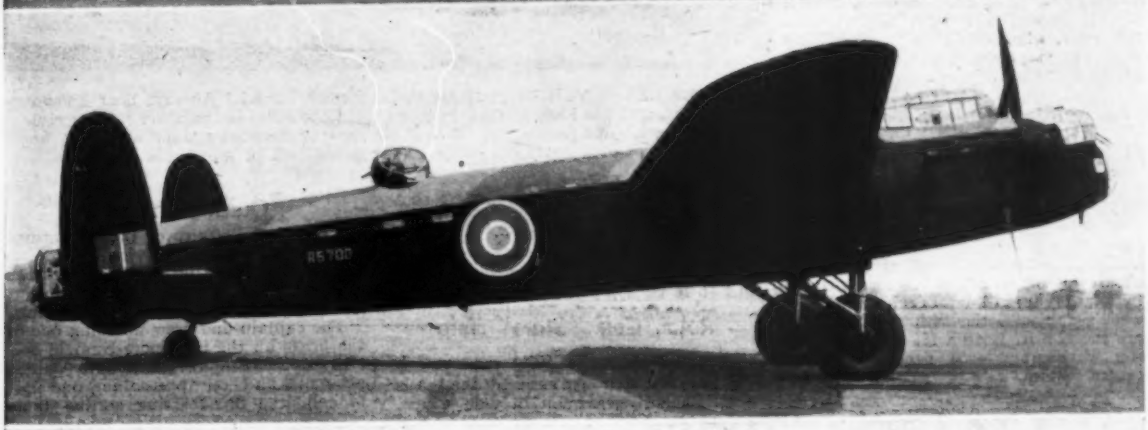
TO the range of British heavy four-engined bombers now being used so effectively over enemy territory the Avro Lancaster may be added. This is the machine which made the historic daylight raid on Augsburg and destroyed much of the M.A.N. diesel engine works in that operation. It is, of course, a four-engined development of the Avro Manchester.

Features of this bomber include nose, tail and dorsal gun turrets on the lines of its giant sisters, the Stirling and the Halifax. The speed and range, and particularly the huge bomb load, are other characteristics which make this latest addition to our bombing strength so effective. It was probably its fighting and bombing efficiency, combined with good performance, which caused it to be selected for the Augsburg raid.

The engines are four Rolls-Royce Merlins carried in underslung nacelles. Three-bladed constant-speed airscrews are fitted.

The Lancaster is in large-scale production both in this country and in Canada.

Points of interest in this close-up of the nose of the Lancaster are :—the flame dampers over the Merlin engine exhausts; the D.H. airscrews; the exceptional visibility in all directions from the pilot's cockpit (including see-behind blisters); the extension of the bomb bay as far forward as the front of the pilot's cockpit; and the undercarriage details.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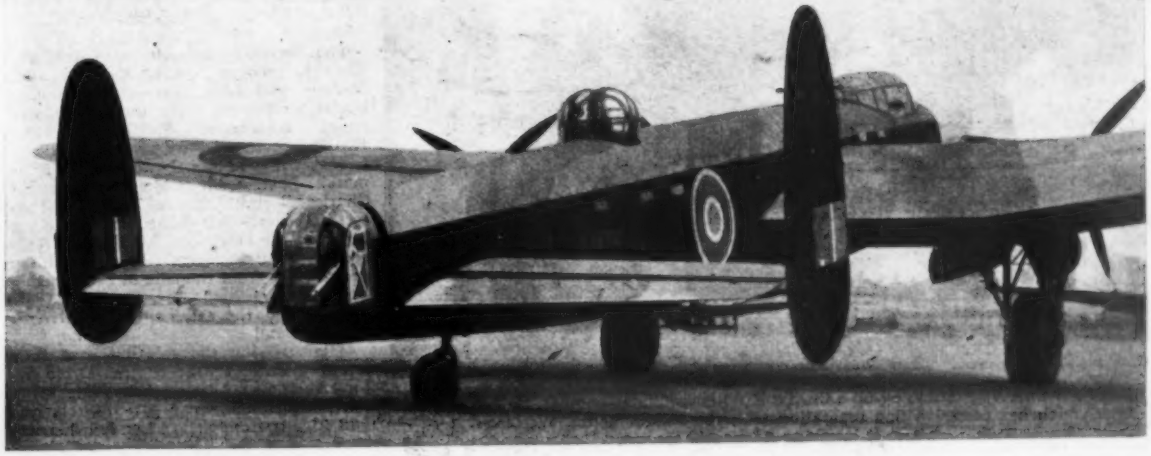


HERE AND THERE

Test Pilot a Director

RECENTLY we announced that Mr. Lipscomb, chief designer, has joined the board of directors of Short Brothers. We are glad to be able to add to the list Mr. J. Lankester Parker, Short's chief test pilot, whose work for the firm since 1916 has played so important a part in the qualities of its products.

New Style Recognition Drawings

THE new series of aircraft drawings introduced by *Flight* have been widely appreciated. Every week in the section appertaining to aircraft matters, two types of aircraft are illustrated and their essential characteristics stressed in a manner extremely useful and novel to observers, the details being accompanied by a large illustration of each type. This week's subjects, the fifth of the series, are the U.S.A. Boston III and the Hudson V bombers—see pages *a* and *b* centre section.

Scale Model Instruction

IN one of the classrooms at the M.T. School for W.A.A.F. drivers there is a perfect model of a town, made to the scale of one inch to ten feet. Motor cars, buses, railway lines, roads, traffic robots, buildings and bridges are all represented. The trainees learn the highway code and accident procedure on this model, made entirely by an R.A.F. corporal instructor for the modest cost of 1s. 6d.

The corporal is now busy making a relief map of the routes and surrounding countryside where the trainees go out to learn convoy driving.

OLD LADIES NEVER DIE : Heracles, the former Imperial Airways liner known as the "Grand Old Lady of the Air," flew 1,318,990 miles in ten years and carried more than 100,000 passengers. Now she is being dismantled and her metal will be used again, no doubt in the production of warplanes.

R.A.F. Golf "Stars" Help R.A.F. Fund

A GOLF match organised by the Leeds and District Union of Golf Clubs, played by Flt. Lt. Henry Cotton and Cpl. Adams, R.A.F., against R. E. Ballantine and Alex Kyle, British Amateur Champion, was the star event of a series of golf matches in and around Leeds which brought in £3,150 for the R.A.F. Benevolent Fund.

Another "sporting" gift is £161 from the Scottish Ice Hockey Association, being a half-share from the Association's recent charity ice hockey tour.

Quick Thinking

AMONG the stories of the adventures of British Airways flying boat crews in the Antipodes after Japan entered the war, is one which demonstrates what great responsibility fell to their captains.

The captain and crew manning one of the boats on the Singapore-Karachi section of the Empire route were Qantas personnel and, on approaching one port of call, the broadcasting station there suddenly went off the air for no apparent reason.

In the circumstances, the captain immediately decided not to go any nearer but to return to his starting place, and on bringing his aircraft safely down there, learnt that his "hunch" had been a very sound one.

His scheduled destination was being bombed by the Japs at the time.

KITTY'S CLAWS : Bombing-up a Curtiss Kittyhawk fighter-bomber, an American type which has earned a fine reputation with the R.A.F. in the Western Desert, where it is giving admirable service.

A.T.C. Nation-wide Parade

IT is estimated that more than 250,000 A.T.C. cadets paraded in Great Britain on Sunday last on the occasion of the Corps' Thanksgiving Day celebrations. Wings and squadrons in almost every city, town and village took part.

In London, some 10,000 cadets, under the command of Air Cmdr. J. A. Chamier, attended a great parade in Hyde Park, where they were addressed by the Bishop of London, Dr. G. F. Fisher.

The Secretary for Air, Sir Archibald Sinclair, accompanied by Capt. H. H. Balfour and Lord Sherwood (his two Under-Secretaries) were there, and Viscount Trenchard, Marshal of the R.A.F., reviewed part of the parade of twenty wings before the service, and the march past. Air Chief Marshal Sir Charles Portal, Chief of the Air Staff, headed seven Air Marshals, including heads of the Dominion Air Forces. Two senior Russian officers also watched the proceedings from the side of the saluting base, past which the 10,000 cadets marched to the strains of the R.A.F. Central Band.

After passing the saluting base they marched down the Serpentine Drive behind their own bands, their route being lined with some 40,000 parents, relatives and friends from the 73 London districts they represented.

MOBILITY

Mobile Forces Need Mobile Supplies : Cargo-carrying Aircraft : The Need for an Air Transport Organisation

By Dr. V. L. GRUBERG

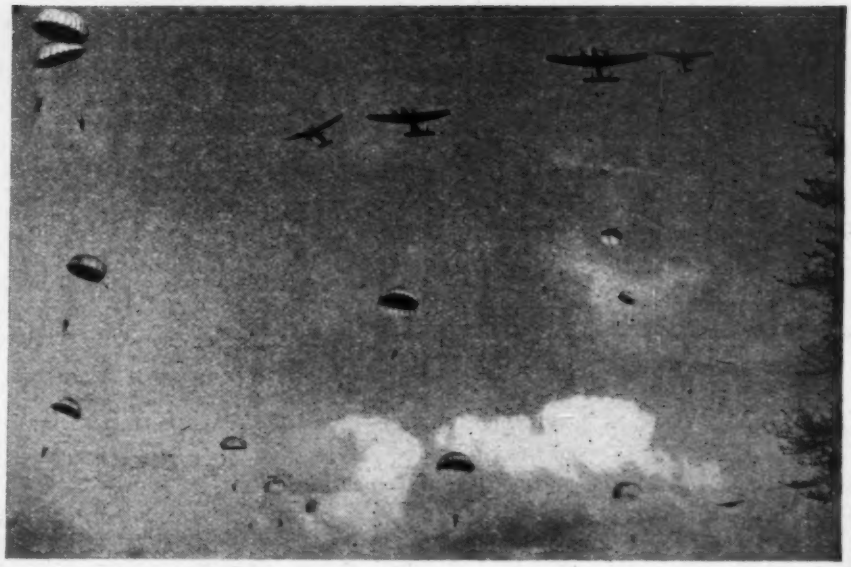
NEVER in the past have speed and mobility been so urgent a demand of tactics and strategy as they are in the present war. The large-scale employment of mechanised forces and aircraft has created a new rhythm of the war machine expressed in the acceleration of movements and combats. This increased rapidity of combat units necessitates a less rigid and more mobile transport organisation.

The call for higher mobility particularly applies to the Air Force. It is most urgent in combat areas where air units closely co-operate with ground forces which may be spread over a long line of operational zones. For the Air Force must be capable of throwing in its weight at any required time and at any special place.

This high mobility, which is characteristic of modern military operations, cannot be achieved if men alone are moved swiftly from one fighting zone to another. Supplies must move in a manner which harmonises with the general tempo of operations. In the days of Alexander the Great supplies for the combating forces were carried on camel caravans. In more modern wars horses, mule carts, railways and ships were employed to keep up a constant stream of necessities for the fighting units. But with the high degree of speed and mobility achieved on the ground, when important strategic advances or retreats are in the

The Bristol Bombay was the last bomber-transport type to be built for the Royal Air Force. On the right is one flying over its base in the Middle East.

The Junkers Ju.52 (below) was originally a commercial three-engined aircraft. Since the war it has been used extensively by the Germans for troop transport and the dropping of parachute troops.

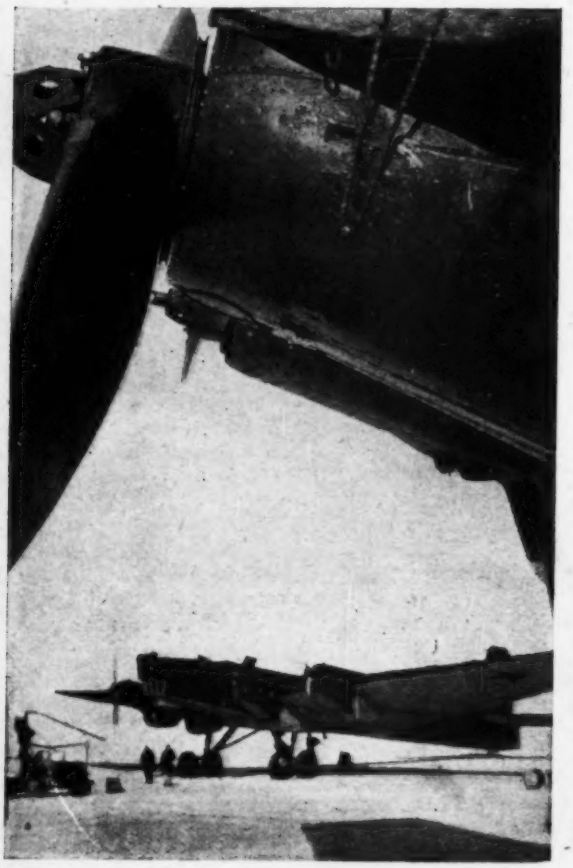


Paratroop training has not been neglected in England. Here are some jumping from two Whitleys. The Lysanders carried photographers and were no part of the actual service.

region of 50 miles per day, and air operations are conducted at a speed of 300 to 400 m.p.h., it would be hopelessly out of date to rely exclusively on seaborne and permanent-way transportation systems.

This does not purport to mean that ship- or rail-borne supplies have lost their *raison d'êt e*. They are, as they used to be, essential for keeping supply lines in operation. But with the new demands of mobility in modern warfare they have lost their monopoly and should be augmented by *air supply lines*.

The call for a greater rapidity of movement and better mobility of supplies is all the more important as the very character of modern operations is "fluid" (that is not rigidly confined to lines but rather to areas of combat). This frequently necessitates the sudden transfer of forces and equipment to places where they are more urgently required and where they can be more advantageously employed. The main issue of the battle may often depend upon the capacity of the transport organisation to effect such rapid changes.



On one side we have, then, a situation when split-second decisions, and consequent rapidity of movement, may decide the fate of vital strategic developments. On the other side, the vast consumption of material which is typical of modern battles calls for constant and rapidly forthcoming replenishments of supplies. How can the two apparently divergent qualities of the modern battle be brought to a harmonious and complementary function?

The only answer is a generous employment of the most mobile instrument of transport, that is, of aircraft. Neither rail nor motor transport is adequate. For with the fluid condition of battles there may frequently be little time left for the sudden extension of railway systems. Nor can the vast amount of labour and material be justified under conditions in which the front is anything but static, and when newly erected lines may soon be within the immediate danger zone. Aircraft alone can be switched off from one zone to another and is not tied to permanent routes which may be endangered the moment they are completed. In this war of fighting zones spreading over continents, the mobility of supplies is indeed an essential condition of success. This is particularly the case when war flares up in zones so distant from main production and supply centres that a normal surface route may bring the urgently required material too late to be of real use.

Russians make use, in the Crimea, of four-engined bombers of obsolescent type (left) for the transport of ammunition.

THE AMERICAN WAY : A 37 mm. anti-tank gun and its crew towed to the aircraft which is to bring them close to their place of action.

MOBILITY

To put this conception of mobility by means of swift air transport into practice it is necessary to have the right type of cargo-carrying aircraft, a chain of suitable airfields and all the usual paraphernalia involved in the operation of long-distance airlines. Practically every combatant nation has some types of aircraft used for the transport of cargo.

The Italian Air Force developed an efficient, if expensive, system of air supplies during Mussolini's Abyssinian escapade. In this campaign the Italians had no more than about 8,000 lorries, while entire army units, such as the Eritrean Army Corps during their march from Quoram to Dessie, the second Army Corps, and the "Celere" Group, were supplied and fed for days and more, from the air. In fact, a German report mentions that the total weight of supplies carried and dropped by the *Reggia* was almost as large as that of bombs.

German difficulties in the Russian campaign are illustrated by this picture of supplies being transhipped from a Ju.52 to a sledge last winter.

It was this experience that helped the Italians to maintain an air supply system to East Africa which for quite a time sustained the resistance of their ground forces. In this war the main equipment of Italian air transport units is the Savoia Marchetto S.M. 75 "Marsupiale" and the Savoia Marchetti S.M. 82 "Canguru." Italian air transport units equipped with the "Marsupiale" are known to have been co-operating with the *Luftwaffe* on the Russian front. The Canguru is powered with three Alfa Romeo 128 R.C. 21 nine-cylinder radial engines of 950 h.p. each and has a useful load of about 16,000 lb. It is Italy's biggest aircraft with the greatest range.

Experience

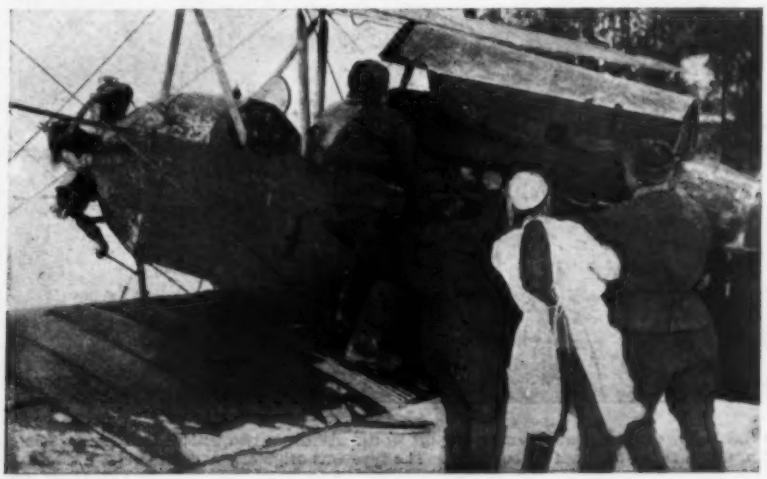
The extent to which proper air transport organisation can support operations of the ground forces and reinforce their staying power was demonstrated during the past winter. In January, 1942, Colonel Morzik of the *Luftwaffe* was charged with the task of organising a system by which German units isolated on the Russian front could be supplied exclusively from the air. Since this isolation was of a military nature as well as due to snowbound surface routes, everything, from food to ammunition, had to be supplied from the air. Every day hundreds of the Ju. 52s were employed in such operations. Major V. Nekulin, of the Soviet Air Force, describing the activities of Nazi troop transport planes, says that "German transport planes have been operating at the front from the very outset of the war. Before the attack on the U.S.S.R. one-third of Germany's transport planes were attached to the 11th Air Corps, including all the airborne units . . . Now, however," when the German command is compelled to use its parachute units as ordinary infantry, to close up the gaps at the front, the situation has changed. The 11th Air Corps is now (late winter) engaged in the rapid transport of troops from far in the rear to the front.

"In January German troops from Denmark and Yugoslavia were transported by plane to the Soviet front. On one occasion a reserve battalion was despatched from Orsha to Yukhnov by plane, each plane carrying thirteen fully armed men. Transport planes returning from the front to the rear are sometimes used by the Germans to convey plundered Soviet goods. Thus on the southern front, according to statements of war prisoners, transport planes heading for Germany carried pigs."

The main equipment of the *Luftwaffe's* transport units are the old but reliable Ju. 52s. Although on occasion the Ju. 90, a four-engined transport, and Focke-Wulf 200 were used, the Junkers 52 form the bulk of equipment and have been used in all operations of transport units and airborne attacks such as Crete, etc. It has been stated that one group of Ju 52 transport aircraft carried some 440,000 gallons of fuel oil alone; that is, approximately equal to 420 fully loaded railway waggons.

The Junkers 52 is powered with three B.M.W. 132 9-cylinder radial engines of 850 h.p. each. It has a useful load of 7,700 lb. and its freight space consists of 695 cu. ft. above floor and four holds with a total capacity of 124 cu. ft. It carries alternatively 14 to 18 men or 12 stretchers. Another German cargo aircraft is the Junkers Ju 89, a military version of the Ju 90 built for the *Luftwaffe*. This is powered with four Junkers Jumo 211 12-cylinder inverted V-type liquid-cooled engines. The original Ju 90 had a load capacity of 13,860 lb. unarmed and without fuel, and a total space capacity of 2,790 cu. ft.

So much for the enemy's wide and effective employment of cargo carrying. While the Allies have not hitherto employed transport aircraft



The Russian Air Force makes use of small aircraft as ambulances. Here a wounded soldier of the Red Army is being taken to base hospital.

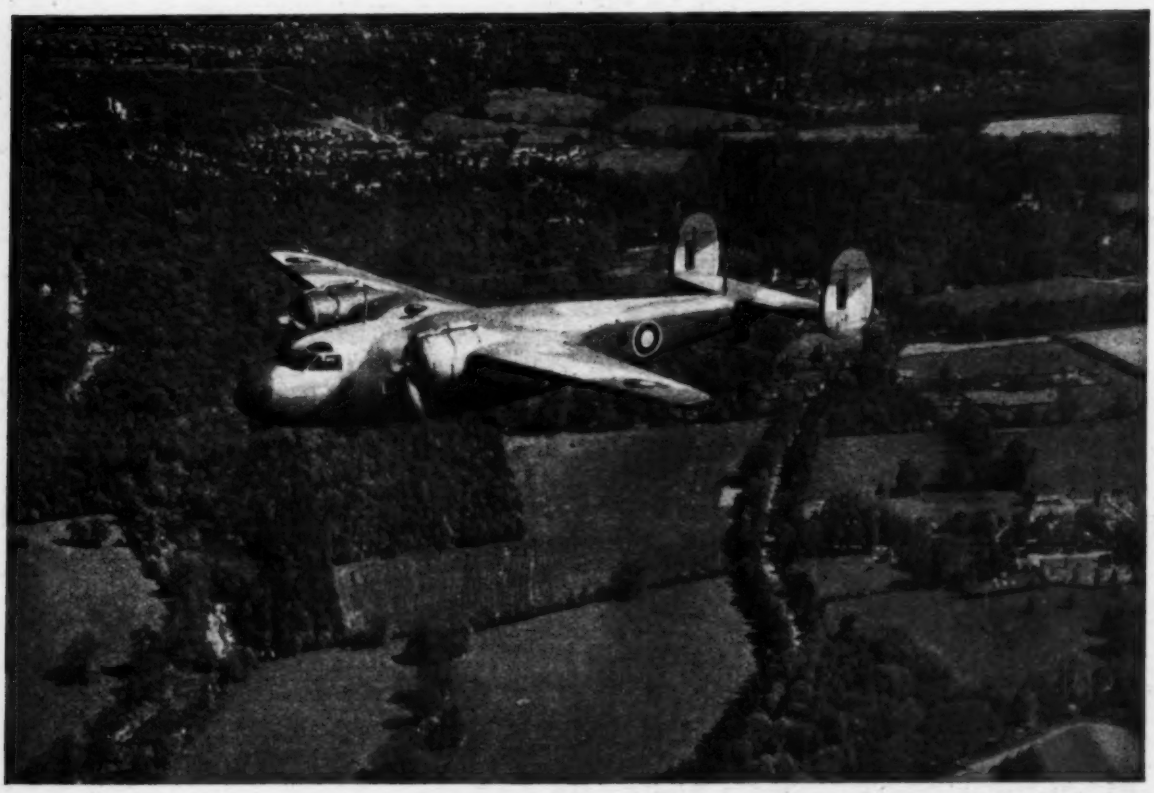
MOBILITY

German soldiers emplane in a Ju.52 on the Russian front. The machine is very slow, but still a great deal faster than any form of land transport.

for the carrying of war supplies to the same extent, it would be unfair to suggest that this essential method of transportation has been entirely neglected. In the Whitley, the good old Bombay, and the Ensign the R.A.F. has still useful load-carrying machines. Powered with four Armstrong-Siddeley "Tiger" engines of 850 h.p. each, the Armstrong-Whitworth Ensign has a pay load, plus crew, of 9,000 lb.; the Armstrong - Whitworth "Whitley," powered with two Rolls-Royce "Merlin" engines of 990 h.p. each and when armed has a military load of about 6,000 lb.; while the Bristol "Bombay," with two Bristol Pegasus engines, has an empty weight of 13,800 lb. and loaded 20,000 lb. (Junkers Ju 86 weight empty 12,980 lb., loaded 18,040 lb.; total disposable load 5,060 lb.).

The Russians, too, employ a number of obsolete bombers and other aircraft for their air transport. The Russians were not only the first to develop on a substantial scale airborne infantry but have also an efficient organisation for transport of supplies by air. In many instances during the severe fighting, transport aircraft of the Soviet Air Force has brought urgent relief to hard-pressed units. During the Battle of Crimea, for instance, they employed the T.B.3, a cantilever mid-wing monoplane bomber, powered with four M-34 engines of 830 h.p. each. And they have made good use of smaller craft such as the Stal-3 for rapid ambulance work. In fact, a large number of aircraft of the "Aeroflot" State air transport service are being used to carry military supplies.

The United States Air Corps has a range of cargo aircraft in service, and new types are being currently manu-



The De Havilland Flamingo is used by the R.A.F. for communication and transport work. With its two Bristol Perseus engines of 930 h.p. each, it has a speed of 239 m.p.h. and a range of about 1,300 miles. The type was originally a commercial aircraft.

MOBILITY

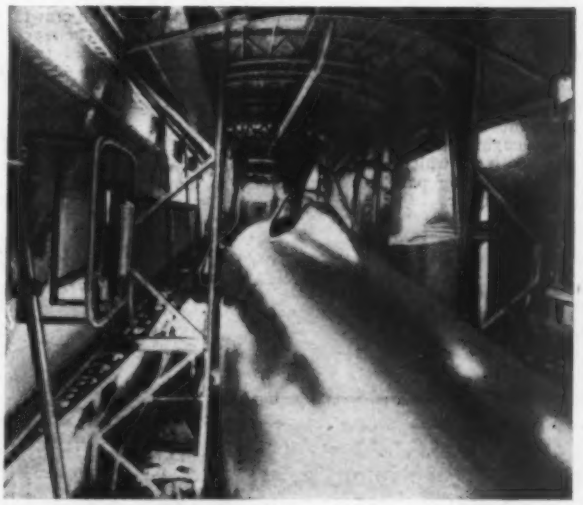
STILL GOING STRONG: The Armstrong Whitworth's "Ensign" is used for carrying all kinds of equipment on the important supply route across the African continent.

factured. They range from smaller types like the C-27, a Bellanca with a Pratt and Whitney 575 h.p. engine, to large twin- and four-engined types. In the large transport class are the C-33, a Douglas low-wing all-metal monoplane, powered with two Wright 750 h.p. engines, the C-39 for cargo transport, powered with two Wright 835 h.p. engines, the C-41 Douglas, capable of carrying 14 men, the C-42 Douglas, powered with two Wright engines of 1,000 h.p. each and with a useful load of 8,600 lb., and finally the C-54, yet another Douglas, a four-engined job now in mass production, designed for a useful load of 17,575 lb.

The Need for Expansion

From the West African ports to the Middle East, along the new-established supply route, British and American aircraft are employed in carrying all sorts of war material consigned from the U.S.A. for the Middle East and China. But what is needed is a much wider employment of transport aircraft, a numerically strong organisation capable of executing rapid transport to the various theatres of war where and when urgent supplies are wanted. Had such an organisation been available and at the disposal of the R.A.F. during the Burma operations, the developments there might have been very different. As it is, there is a considerable discrepancy between the speed of military developments and that at which our supplies are moving.

No one would suggest that with the Allied supply lines stretching across the Atlantic to the White Sea, air transport aircraft can exclusively replace shipping. But it should form an equally important component of our supply system.



CANGURU'S POUCH: The Savoia Marchetti 82, Italy's latest transport aircraft, is roomy enough to accommodate a fighter in its bulky fuselage.

Commissions for Air Crews

DECISIONS eminently satisfactory to personnel of the R.C.A.F. overseas were reached at the air conference recently held in Ottawa, according to A.V-M. Harold Edwards, air officer in chief of the Canadian overseas forces, who has just returned to London from attending that parley.

As far as air crew is concerned it has been agreed that any air crew of commissionable quality shall be commissioned. Previously only a certain percentage of those obtaining top ranking in their courses have received commissions at the completion of their training. Under the new agreement it is even possible for an airman to apply for a commission.

Non-shimmy Undercarriage Patented

THE Bell Aircraft Corp., manufacturer of the Airacobra, is assignee of a United States patent issued in June to George L. Hineman, of Buffalo, New York, covering his invention of an aircraft undercarriage the wheels and struts of which do not shimmy in the take-off and landing. The portion of the cylindrical strut which telescopes into the portion rigidly attached to the aircraft structure is free to rotate, but the piston to which the axle of the wheel is attached is connected to the rigidly attached member of the strut in such a way that it cannot rotate, and thereby prevents wabble and vibration.

Engine Cylinder Anti-corrosion Compound

ATTACK of the cylinder walls of internal-combustion engines by acids formed by burning of petrol and lubricating oil is prevented by a liquid compound developed by Ernest R. Irwin, a Government research chemist in Dayton, Ohio, where Wright Field is located, to whom a United States patent was issued in June. The inhibiting agent used is triethanolamine, an ammonia compound, which is mixed with a mineral oil and hot castor oil to produce a thin liquid solution. The triethanolamine is said to neutralise any acid in the castor oil and in the film of mineral oil adhering to the cylinder wall.

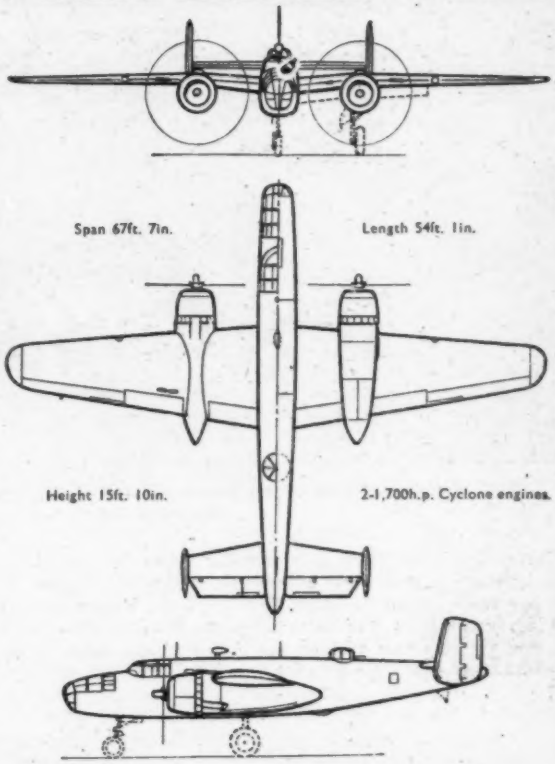
NORTH AMERICAN "MITCHELL" B.25C

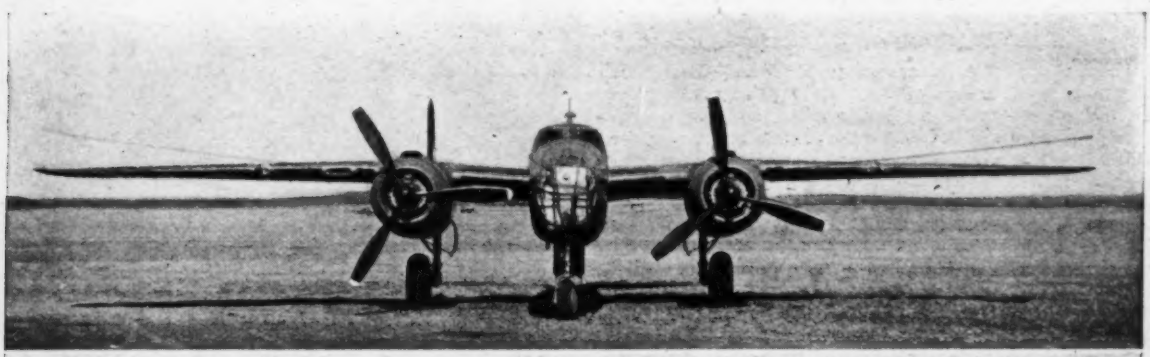
Photographs and General Arrangement Drawing of the Type Which Bombed Tokyo

THE North American Mitchell follows the conventional layout of twin-engined American medium attack bombers. It has a tricycle undercarriage and twin fins and rudders. The latter take the form of end plates on the tailplane. The main plane has a negative dihedral of one-half deg. outboard from the engine nacelles. In the nose is the bomb-aimer, who has a single rifle calibre machine-gun on a flexible mounting. Behind and above him are the side-by-side positions for the two pilots, who have excellent visibility both sideways and forwards. In line with the engines and forward of the main spar is a roomy compartment for the radio operator-navigator. An astro dome is in the roof of this compartment covered with transparent synthetic material which is optically perfect in order that no distortion occurs when sights are being taken with a sextant. A special folding stool is provided for the navigator to stand on while taking sights. The petrol tanks are in the centre section and below these are the bomb racks. In the rear gunner's compartment is a Bendix power-operated dorsal turret with two 0.5in. machine-guns, and, for protection from zooming fighters, there is another twin-gun position in the floor.

Unlike some of the other American types, there is intercommunication between all the compartments. There is a crawl way over the centre section joining the main cabin and the rear gunner's position, and there is also a crawl way under the pilots' position and to the port side of the retracted nose wheel which enables communication to be made with the bomb aimer if necessary. There is, of course, the usual telephonic intercommunication between all members of the crew.

The engines are G.R.-2600-5AB Wright Double Row Cyclones of 1,700 h.p., which are fitted with Holley carburettors. The modern "butter pat" blades are fitted to the airscrew to keep down diameter.





Curtiss Wright

FIRST

Since the Birth of Aviation

1926—The Curtiss Falcon—O-1. First plane designed specifically for observation tasks and purchased in large numbers by the United States Army. Powered by D-12 engine.

1935—The SOC-1, built for the United States Navy, shown here with land gear. Folding wings made it adaptable to limited storage space.

1927—SOC's of this type, equipped with a single float and balancing wing tip pontoons, were placed aboard every battleship and cruiser of the United States fleet, the first model to achieve this distinction. They were launched by catapult.

1942—The O-52, latest Army observation. High wing monoplane, excellent for vision. Slots and flaps make operation from small fields possible.

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Send for YOUR copy of this fascinating 96-page history of aviation by Assen Jordanoff, author of "Your Wings", with illustrations of current fighting types. Send 10¢ to cover mailing cost: Airplane Division, Curtiss-Wright Corporation, Buffalo, New York.

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AIRCRAFT TYPES AND

Boston III and Hudson V Bombers

INCORPORATING a number of modifications recommended by the British Purchasing Commission as the results of experience gained with earlier editions, the Boston III, or DB-7B, is basically similar to the Havoc II, or DB-7A, which is the Boston in night-fighter form.

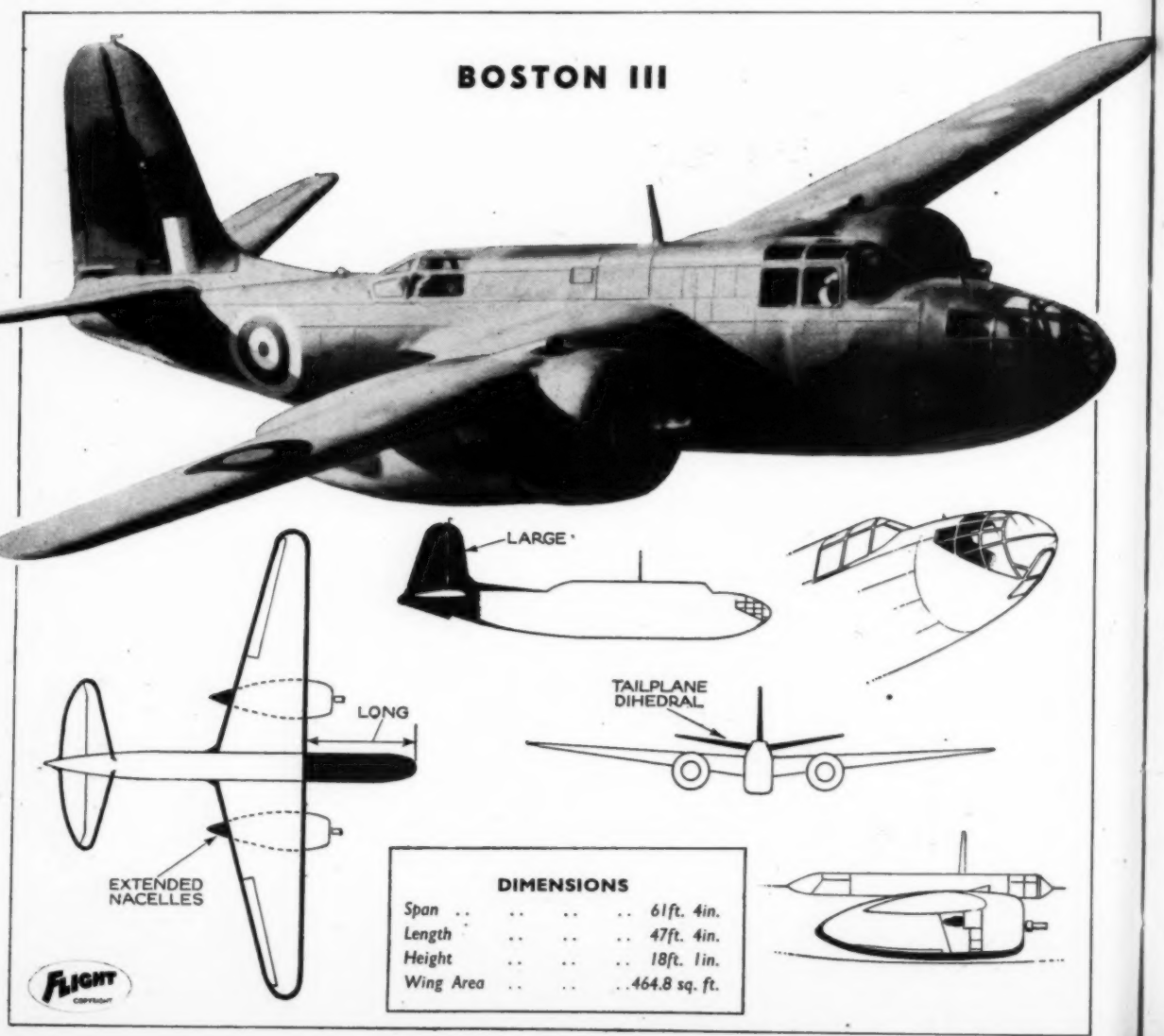
Both the 7A and 7B differ from the original DB-7 in having Wright 14-cyl. Double-row Cyclone air-cooled radial engines in place of the Pratt and Whitney Twin-Wasp units fitted to the earlier Bostons. These Cyclones are the GR-2600 type, giving 1,275 h.p. at 2,300 r.p.m. at 12,000ft., with 1,600 h.p. at 2,400 r.p.m. for take-off.

The chief structural difference between the Boston III and its predecessors is a longer nose section (which no doubt accommodates increased armament), an increased fin and rudder area demanded by the increase of power, and nacelles which extend still further behind the trailing-edge of the wings. Incidentally, the increased area of the vertical tail surfaces is accompanied by a change in their contour, that of the Boston III (and Havoc II) having a steeper slope to the leading-edge of the fin and an appreciably broader apex. Another important feature of its tail group is the pronounced dihedral angle given to the tail-plane, which is greater than that of the wings.

A tricycle undercarriage is another distinctive feature of the DB-7 range of Douglas aircraft.

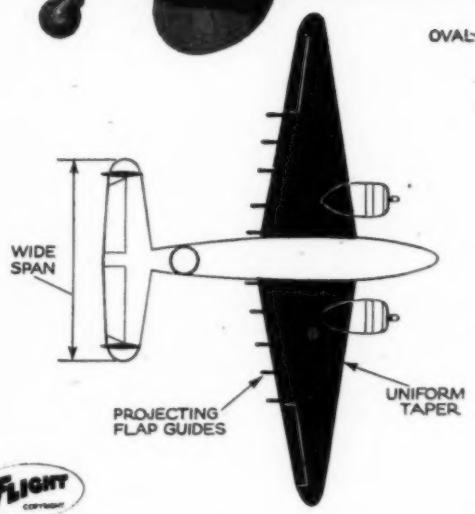
Performance figures for the Boston III and Havoc II as in service with the R.A.F. have not yet been released for publication, but the DB-7B is identical with the U.S. Army Air Services' A-20 attack-bomber, except for certain items of service equipment peculiar to each air force, and American reports quote a top speed of 350 m.p.h. at 12,000ft. for their A-20 aircraft. Its armament consists of four fixed machine guns in the nose (two on each side), two flexible guns in the rear cockpit, and a single flexible gun firing down from the parachute hatch. American figures also give a maximum bomb-load of 2,000 lb.

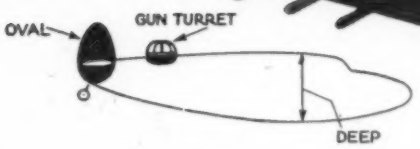
All-metal construction, with flush-riveted stressed skin covering is employed throughout.

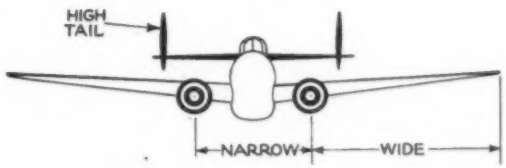


IEIR CHARACTERISTICS

HUDSON V







DIMENSIONS

Span	*65ft. 6in.*
Length	*44ft. 3in.*
Height	*11ft. 10in.*
Wing Area	*551 sq. ft.*

DEVELOPED as a military version of the Lockheed 14 airliner, the Hudson has earned for itself a splendid reputation in the non-stop service of the R.A.F. Coastal Command. It has proved itself extremely reliable and able to get its crew safely home even after very severe treatment, and it now has millions of operational miles to its credit since the war began.

The original batch of Hudson I aircraft were, in fact, the first American machines to go into service with the R.A.F., and, although intended for navigational training, they were found to be an ideal replacement type for the low-powered Avro Anson.

At first their duties were almost entirely reconnaissance, but they proved to be so well able to defend themselves against enemy fighters that they have been used more and more on bombing raids against enemy ports, coastal airfields, and enemy shipping in the Channel and in Norwegian waters.

Gratifying experience with the first batch of 250 Hudson Is led to further orders for improved versions, and in due course Hudson IIIs, IVs and Vs were being flown direct across the Atlantic, the latest Mark V type embodying many refinements.

Fitted with two Wright Cycle GR-1820-G205a air-cooled radial engines, each giving 900 h.p. at 14,000ft. and 1,200 h.p. at 2,500 r.p.m. for take-off, the Hudson V has a top speed of 284 m.p.h. at 15,000ft., a cruising speed of 255 m.p.h. at 19,000ft., a service ceiling of 22,000ft., and a range at cruising speed of 2,160 miles. Its normal loaded weight is 17,500 lb., but it has a maximum overload weight of 2,000 lb., with a disposable load of 5,694 lb. A later version is powered by Pratt and Whitney Twin-Wasp engines.

Armament comprises two fixed Browning machine guns mounted above the bomb-aimer's position and operated by the pilot, twin Brownings in the electrically operated Boulton-Paul turret on top of the fuselage near the tail, and one hand-operated Vickers "K" gun on each side of the fuselage, firing through a window. There is also a retractable manual gun position beneath the tail.

The "safety firsts" are now on the retired list. They weren't safe and they were never first. Not so SAFETY FAST — affectionately known as M.G. to countless pre-war rally enthusiasts now on active service. Many of these speedy and lion-hearted cars are showing every bit of their dash and stamina on sterner tasks. That's true of the nation, too.

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WORK SERVICE FLIGHT AT WORK

Portable Runways Laid at Speed : Bomb Craters Obliterated in Minutes

(Illustrated by "Flight" photographs)

The first stage in laying a portable metal runway. Rolls of wire mesh—each 25 yd. long by 10ft. wide—are laid side by side on the ground.

IN the issue of *Flight* dated May 7th this year we dealt fully with the origin and employment of the R.A.F. Work Services Squadrons. Briefly, they are the R.A.F. equivalent of the Royal Engineers of the Army, and they have actually taken over the work from the R.E.s who used to be responsible for the construction and maintenance of airdromes in the field. The R.E.s will still be employed on airfields operated by the R.A.F. Army Co-operation Command, but, with this exception, all the other Commands at home and abroad will have their quota of R.A.F. Works Services. In the ordinary way, while only routine maintenance has to be carried out, a W.S. Flight of some 70 or 80 personnel is stationed at each airfield. If, however, big constructional work is in hand, the necessary number of extra men are posted, complete with living quarters, field kitchens and all the necessary plant, for the work in hand. It was back in the days of the Battle of Britain that the urgent need for the new service was first felt acutely. The attempt by the *Luftwaffe* to ground our fighters by continual bombing of our forward airfields meant day-and-night work to keep them in usable condition.

Works Services Units

It was this battle which decided the R.A.F. to form its own engineering corps, which officially came into being in February, 1941. The official designations and scope of the various sub-units are:—

Works Squadrons.—These have already greatly increased in numbers, and, in step with the programme of air expansion, further developments are planned for the future. The increasing strength of these units, and added experience, are producing the capacity to carry out larger services, both in new construction and in maintenance, which is their normal occupation.

Plant Squadrons.—These are equipped with modern civil engineering equipment—giant bulldozers, diesel rollers, heavy mobile cranes and American-type scrapers. These and repair wagons manned with R.A.F. personnel, and are highly mobile, constitute a shock

The second stage in laying a portable metal runway. The 25-yd. lengths of wire netting are linked together by strips of steel threaded through the wire reinforcing rod ends.